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Telecommunication Trouble Ticket System

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By

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Abstract

The Telecom Trouble Ticket System is used to track and report all problems with the services the telecommunication companies provide. The Trouble Ticket system will provide an integrated, automatic trouble reporting mechanism that assigns trouble tickets to technicians through printed trouble tickets and e-mail transmission. The system will be able to generate reports to aid in diagnosing equipment or network problems. Historical information will allow for maintenance agreement analysis and trend analysis studies. The users will be able to run standard reports and make queries from the trouble analysis system to track the progress and resolution of trouble tickets. (i.e., trouble ticket number, date, technician name, etc.)

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I. Introduction

It is ironic that in the telecommunications industry, communications service providers (CSPs) often suffer from a failure to communicate within their own organizations. As a result, detecting, validating, escalating, testing, repairing, resolving and reporting on customer problems and service requests are all usually disconnected processes. Help Desks and Customer Service organization with CSPs rely on countless disconnected systems and business processes that cross telephony, IT, network and human resources.

Because telephony and IT technology communicate and integrate poorly, Telecom Trouble Ticket System is introduced in this paper to help users automate, integrate and resolve customer service and repair processes for testing and trouble ticketing, cut the costs associated with trouble resolution, stop unnecessary truck roll, manage fluctuations in trouble ticket volume, reduce overtime costs, report on trouble resolution processes and ensure customer satisfaction.

Telecom Trouble Ticket system is part of the eLation software. eLation is the first telecom system designed for the ILEC market using Microsoft's new .NET framework. eLation is a full suit of OSS applications including customer care and billing, automated provisioning, capital credits, financial systems, automated mapping & facilities management and more. It allows companies to combine all major business function into a single easy-to-use system.

Innovative Systems, LLC, the company that I'm working with started to implement eLation software about two year ago. The main objective of building

eLation is to build the software that can take care of everything in the telecommunication company and is why we are still implementing and adding more feature into it. We have tried to put as many features as possible into eLation.

We try to market to a company that has the best match of our software functionality and we then add more functionality as they request. We try to sell to the small company first because they normally don't require a lot of software features then we keep adding new features as we go.

The next telephone company that we tried to sell eLation to requested a feature implementing a trouble ticket system so my supervisor gave me a chance to implement the whole trouble ticket system for this telephone company. I first implemented a stand alone system then integrated it into existing eLation software. I also implemented in the eLation itself to make them work perfectly together.

I started with designing the database (which I had to change many times during the implementation state). I separated database into two part, one was storing configuration data that hardly had to be modified and the other is for storing the data that is manipulated often. Then I designed interfaces for the users to be able to interact (insert, update, delete,..) with the database. I finished the rest and tested before integrated it with eLation software.

What is theTelecom Trouble Ticket System?

A Trouble ticket (sometimes called a trouble report) is a mechanism used in an organization to track the detection, reporting, and resolution of some type of

problem. Trouble ticketing systems originated in manufacturing as a paper-based reporting system. [1]

Why the Telecom Trouble Ticket System was implemented?

The old Trouble Ticket Systems involved paper. Technicians typically drive to a central facility at the beginning of a shift to pick up a stack of tickets (also know as work orders or service orders). They then disperse and begin working the tickets in sequential order. At the end of the shift, they return to the central facility to turn in their tickets with handwritten notes on what they have accomplished what parts they used and so on. Clerks type the notes into a scheduling system.

The goal of the Telecom Trouble Ticket System project is to design and implement a solution that replaces these old paper-based systems while improving functionality.

Using the Telecom Trouble Ticket System will provide a more efficient and homogeneous method for telecommunication companies to provide solutions of users problems/requests. Better tracking of problem will provide a knowledge-base, a collective set of solutions to known problem, increasing the efficiency for the division and its users.

What is the Trouble Ticket System used for?

The Telecom Trouble Ticket System is used to replace the old paper-based system. This easy to use system will be used to manage the customer issues and standardize support processes. It can also be used to track customer

support history over time. In the sprite of the old paper-based system, the Telecom Trouble Ticket System will keep the information in the electronic format. It's make data easy to manipulate and also saves storage space.

II. Project Objective

To design and implement a Telecommunication Trouble Ticket System for telecommunication companies that replaces the Trouble Ticket paper-based system. The new Trouble Ticket System will be deployed by Telecommunication companies to keep track of troubleshooting service for their customers. The system is implemented according to the function specification.

III. Function specification

After interviewing the users, the project team came up with the software requirements (what the main features of the software are.) The list below is of the main features that will be included in the software. These features will be tested and signed off on in the acceptance test plan.

- This system must provide trouble ticket processing and trouble ticket tracking capability. This system should perform the function of receiving, tracking, referring, and clearing trouble reports. Troubles are reported on all services provided by Communications.
- The trouble ticket system should be integrated with other modules of the system so as to populate certain fields on the trouble ticket automatically.
- The trouble ticket system should provide an integrated, automatic trouble reporting mechanism that assigns trouble tickets to technicians through printed trouble tickets and e-mail transmission. The system must provide for the capability for remote distribution of trouble tickets. Desired distribution methods include: remote printing and e-mail.
- Through standard reports and ad hoc capability the operator should be able to generate or create trouble analysis reports to aid in diagnosing equipment or network problems. The reports should include but not be limited to ticket counts and trouble summaries, mean time to repair and technician activity. Trend analysis on vendors and equipment should also be available.

- The trouble tracking system should provide a trouble history report for each trouble recorded and automatically attach the history report to new trouble tickets for reference.
- This system should facilitate in the creation of past due trouble tickets on a priority report.
- The system must have the capability of accepting an unlimited number of trouble tickets per day.
- The system should allow for user-defined trouble codes.
- The system should allow for user-defined resolution codes.
- The system should allow for user-defined cause codes.
- The system should allow for the entry of notes associated with each trouble ticket and with each action item on the trouble ticket.
- The system should allow e-mail notification to be sent to the person who called in the trouble ticket. This could include receipt of trouble ticket, assignment of trouble ticket, and completion of trouble ticket.

IV. Implementation Step

The project is implemented following the steps below. The project team needs to start with the interview step to gather as much information as possible before the team can start doing other steps.

- Interview technical support at the telecommunication companies to determine as-is process and future requirements

  In the company that I'm working with has a support team who go out to the client site and interview the client for the software requirement. Our support people worked with the client for a couple days to learn how the old system worked and observed the problems that occur during the work process. Then support teams came back with the system requirement and sent then to the developer team.

- Inventory current equipment available and determine if additional equipment will be needed.

  We have to prepare and reserve resources that will be use for implementing the system.

- Determine the current hardware configurations at each client site.

  We have to find the system or equipment that similar to the one the client is using so we implement the software that compatible with the one at the client site and work with his equipment.

- Convert the existing database from client to the new system.

For the clients that were using the trouble ticket system from another software company, we need to take their data and convert it into our database structure.

- Implement Trouble Ticket software
- Test each component of the software, integrate test and beta test.

After finishing implementation, I sent the software to the support team to do the testing before the software was sent out to the client to test and use.

- Documentation

After testing support team wrote the manual for the system.

V. Deliverables

After successfully implementing the software, the deliverable items (below) will be delivered to the clients.

- Final version of Telecom Trouble Ticket software.
- Database structure
- Documentation and manual
- Demo and training

VI. System Requirement

Users will need systems that have at least the following specification or better.

- Windows NT® 4.0 Workstation, Windows® 2000 Professional, or Windows® XP Professional
- 300 MHz Pentium II processor (or equivalent)
- 64MB RAM
- 500 MB hard disk drive or greater
- 1 3.5" floppy disk drive
- CD-ROM drive
- Tape backup drive
- 1 available serial port
- 1 available parallel port
- 9600 bps or greater modem
- 15" color monitor
- Mouse and 101-key keyboard

VII. Database structure and design

The Telecom Trouble Ticket System uses 13 different tables (figure 1) to store the data. Each table has its own primary key named ending with "ID" with its type of integer. The unique value of the primary will automatically be created by adding 1 to the maximum existing value. Some data tables were created as independent tables. (eg. TcTroubleTicketStatus and TcTroubleSeverityClass tables) Both tables are used for storing option values.

TroubleSeverityClassCode	TroubleSeverityClass
I	Impaired Service
N	Service Not Affected
O	Out of Service

Figure 1: TcTroubleSeverity Class

These two tables are designed for future enhancement., in case the users want to add more options in the future. The user can just write the query to insert a row into the table, the software will automatically add the new option to the drop down list which is shown in the program (figure 2) Source code doesn't need to be modified. The dropdown list (figure 2) is designed to link directory to the database table. When a database table is modified the values in the dropdown list will automatically change according to the data in the database table that is hooked with the control. The program does not allow the users to modify values in the dropdown but it allows the users to pick one of the values from the list. When the string which represents the value is selected from the

dropdown list, the code value will be stored to the table. For example, when the users select "Service Not Affected", "N" is stored into the table instead of the string "Service Not Affected". By doing so, it will reduce the amount of storage space that's required for storing the data.

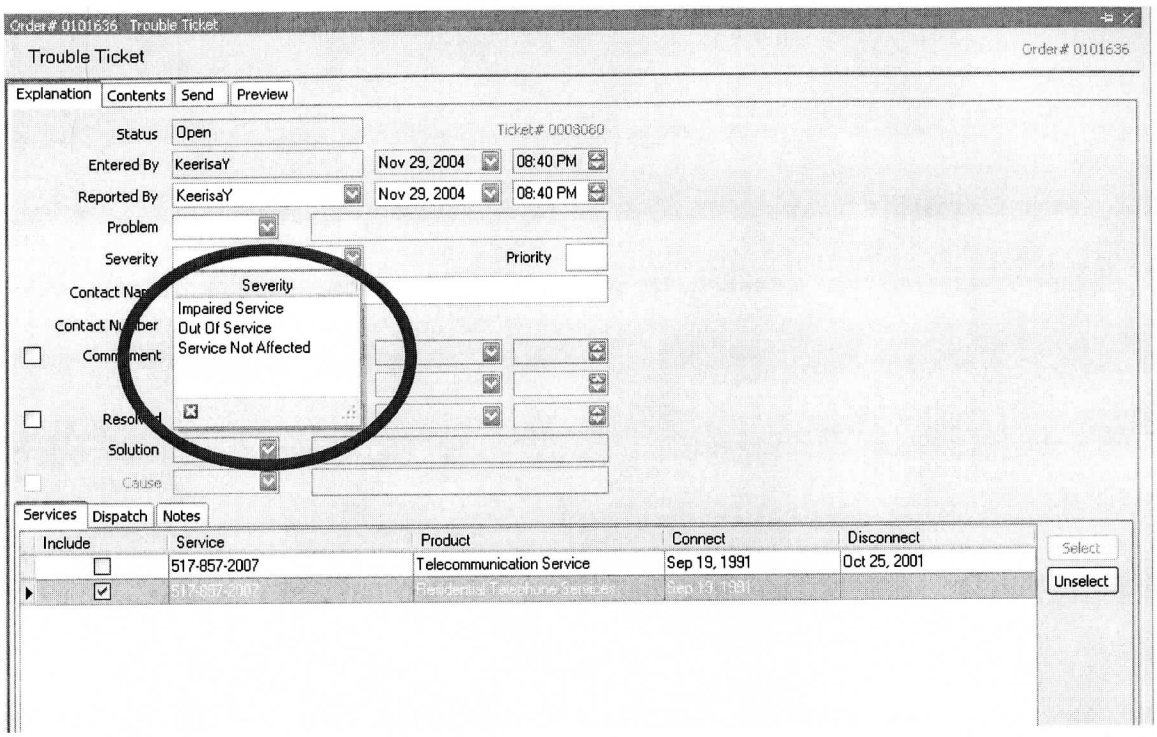

Figure 2: The Dropdown List Shows The Values In TcTroubleSeverityClass

These tables are designed for future enhancement in case the user want to add more options in the future. The user can just write the query to insert rows into the table, software will automatically add the new option to the drop down list which is shown in the program.

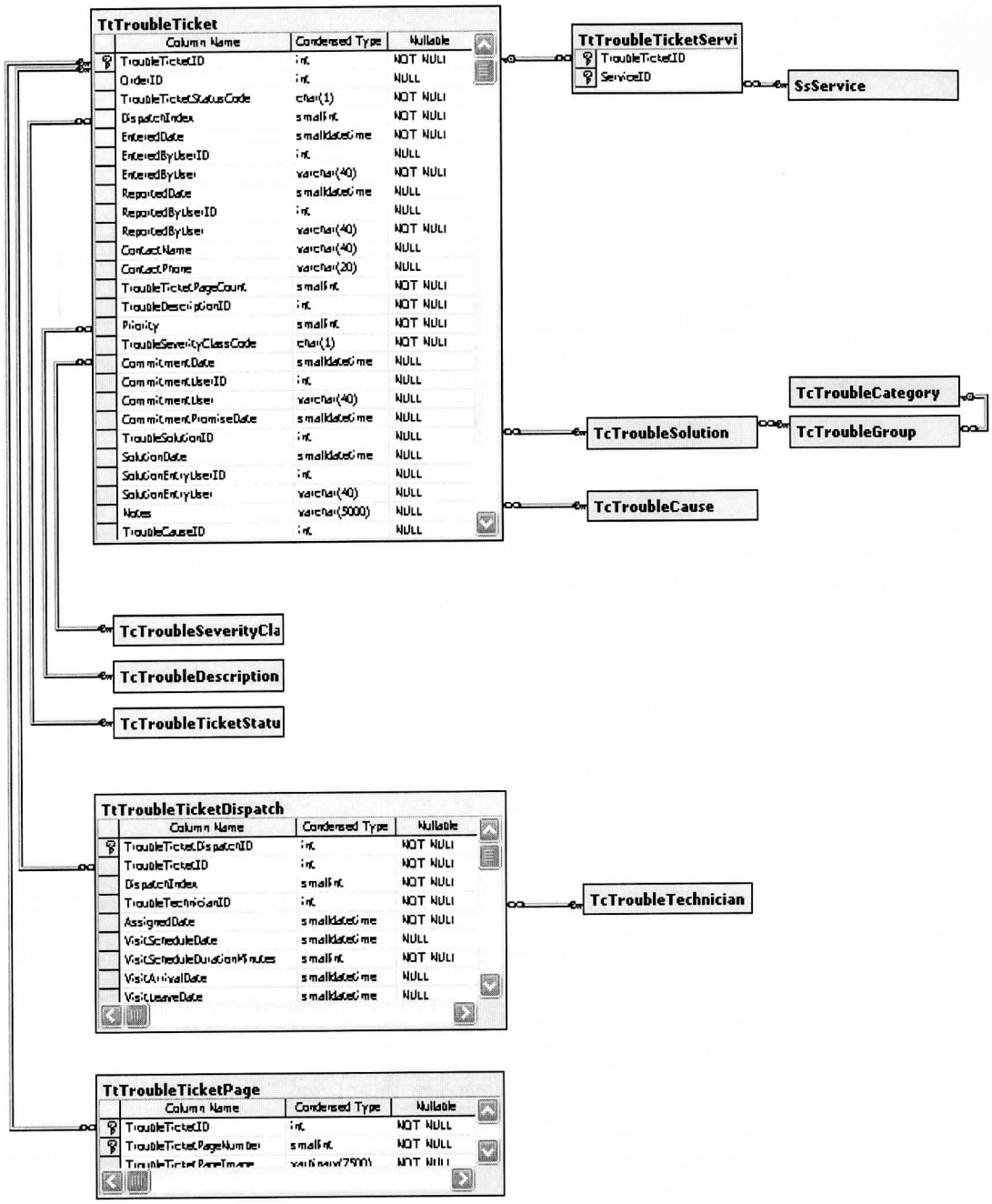

Figure 3: Trouble Ticket Data Structure

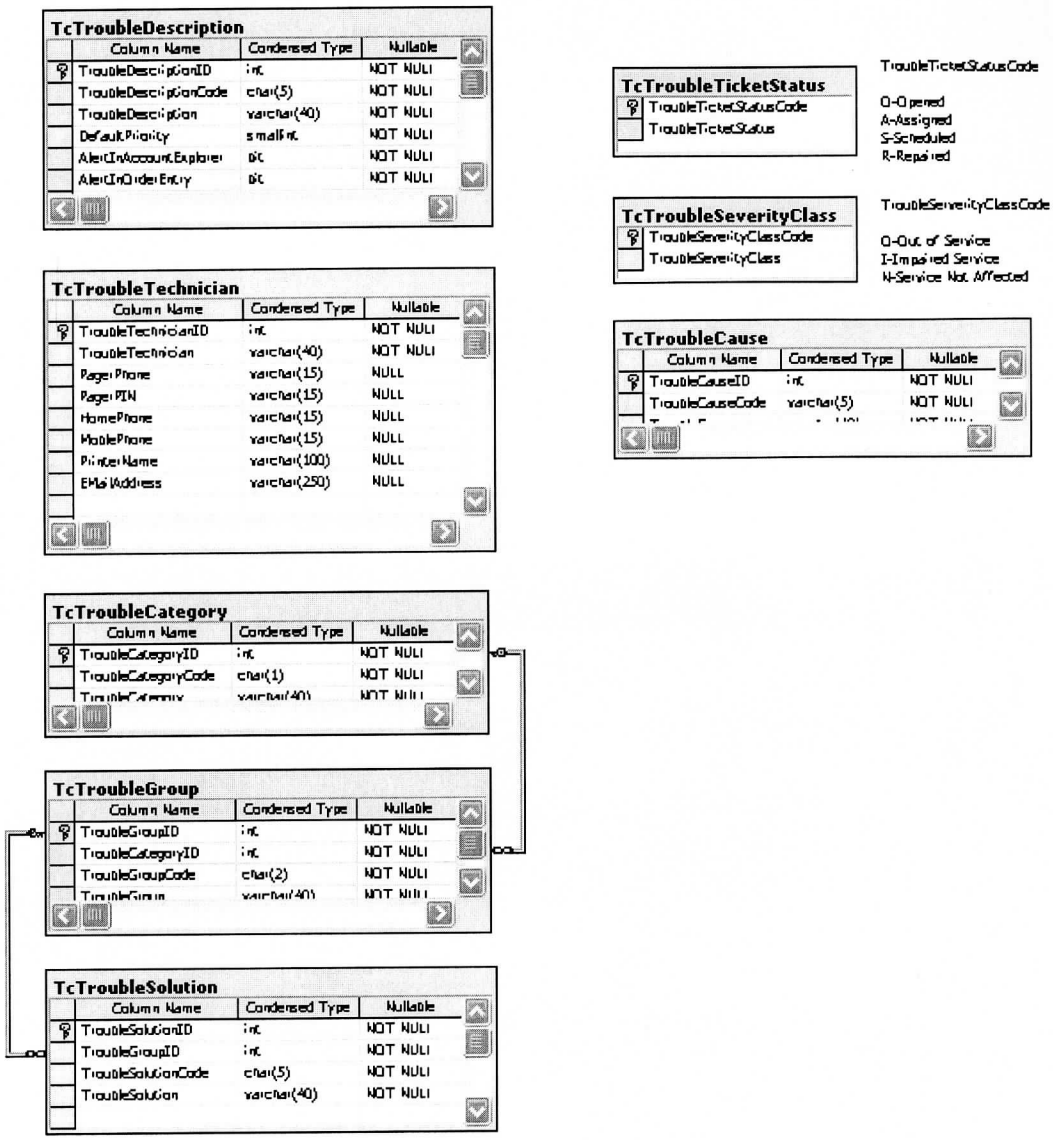

Figure 4: TroubleConfigurationDataSet

The implemented system uses ADO.NET technology to create two sets of datasets named TroubleConfigurationDataSet and TroubleTicketDataSet (figure 3 and 4). The system will load data from the database into the datasets when the program starts. During the process, data in the datasets will get manipulated. Data in the database will get modify only when the user clicks on

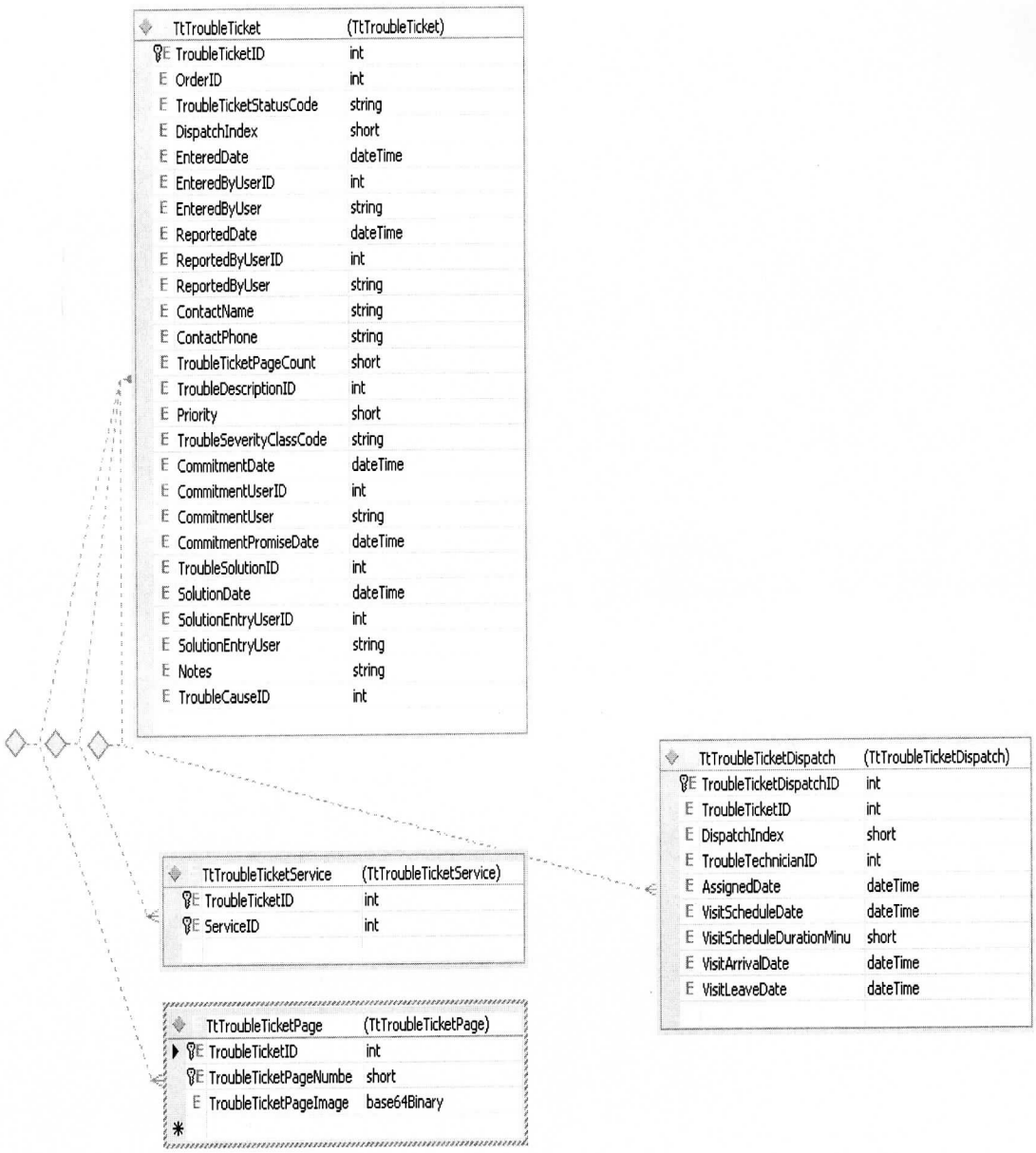

Figure 5: TroubleTicketDataSet

the "Save" button. Users can reject all changes by clicking on the "Cancel" button. Using datasets can reduce the time accessing the database and the software will perform more efficiency.

TroubleConfigurationDataSet contains 8 tables. Most of the data in the tables in this dataset is static data (codes, definitions, class) which is the data

that is unlikely to change. The data in these tables will be create once when first installing the software. Users need to create data in these tables before the entirely system can operated. TcTroubleCategory, TcTroubleGroup and TcTroubleSolution were created hierarchically so when users enter data they need to do it in order, start with TcTroubleCategory, TcTroubleGroup then TcTroubleSolution.

TroubleTicketDataSet contains 4 tables. There is a main table called TtTroubleTicket that can link to every table in both datasets. The most of the program will work with data in this table.

VIII. Trouble Ticket Configuration

Trouble Ticket Configuration part contains five entry screens to let users enter the data into five different tables (TcTroubleTechnician, TcTroubleDescription, TcTroubleCategory, TcTroubleGroup, TcTroubleSolution and TcTroubleCause). All of the configuration entry screen will allow the users to create, delete, modify and rename the selected data in the data table that user's working on. The system has feature that allow users to create a report of data that particular data table by clicking on Report button. Users can view the history of all changes that have been made to the data table. The history screen will show the original versus current value of the row that's modified. It also shows the date and time, row status and user who modifies each data row.

How to Configure a Technician in Trouble

Trouble is a system that provides an easy way to report problems and have the problem assigned to a technician to fix the issue that the customer is experiencing. Technician will be able to pick his own Technician number (4 digits numbers.) If user leaves Technician number field blank, the system will generate next available number to the new Technician. Only the Technician field is a required data in this entry screen.

In the data grid will show all the technician information that are stored into the TcTroubleTechnician table. Click on the caption of each column will show the option to filter and sort the data on the data grid. For TcTroubleTechnician table, the TechnicianID is a primary key. The TechnicianID will automatically

generate by adding 1 to the maximum value or it can be generated by using the number that user entered.

From the Menu Bar, select *Edit – Trouble*

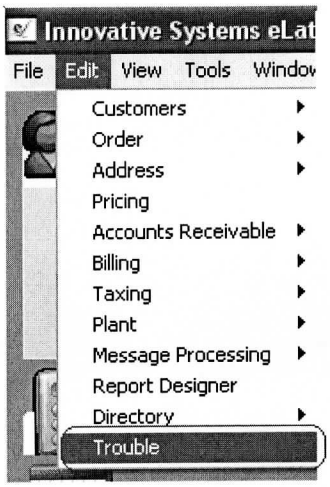

Figure 6: Accessing Trouble Techinician From Main Menu.

Add a New Technician

The user can create a new technician at anytime, each technician will have his own unique TechnicianID. Only technician name is a required field for creating a new technician.

1. Select the *Technician* Tab.
2. Click *New.*
3. Enter a number for the *Technician Number.*
4. Enter the technician's name and any other important information needed.
5. Click *Create.*
6. Click *Save.*

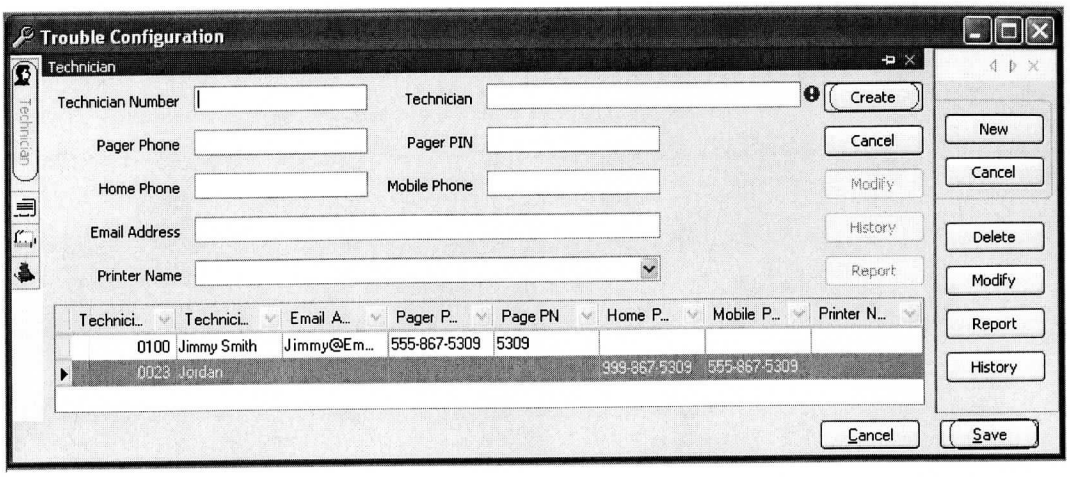

Figure 7: Trouble Technician Entry Screen

Delete an Existing Technician

The system will allow the user to delete the technicians that have no ticket or tickets with closed status are assigned to them. If deleting technician that has no ticket assigned to him, system will delete that technician permanently from the database but if for the technician who has closed status tickets assign to him, system will mark that technician as "Obsolete" and technician will not be shown on the data grid again.

1. Select the *Technician* Tab.
2. Select the *Technician* you wish to delete.
3. Click *Delete*.
4. Click *Save*.
5. If the *Technician* currently has trouble tickets assigned you will not be able to delete him/her.

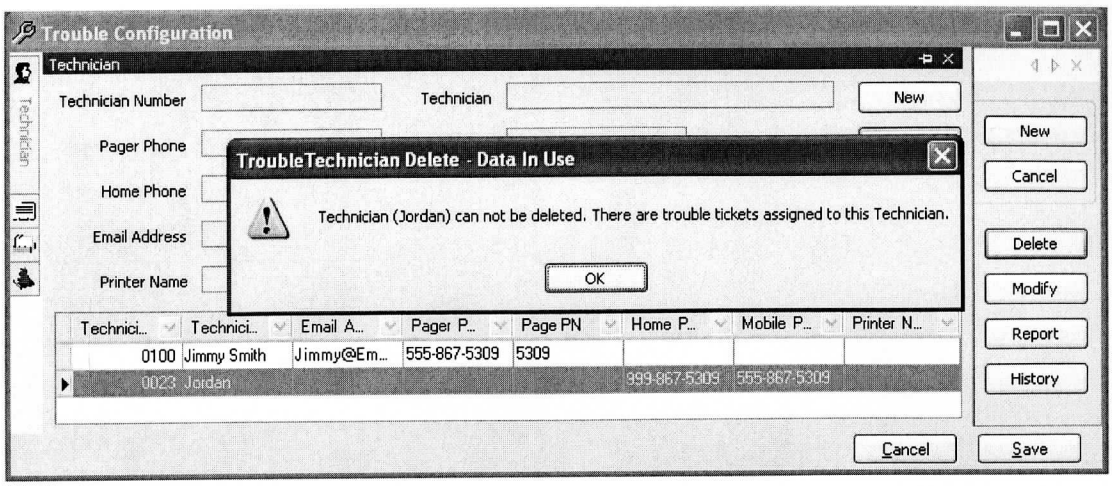

Figure 8: Trouble Technician Delete Error Message Window.

How to Modify Technician information

When user modifies technician data, system will check for the duplicate row in the database. If there is no duplicate row in the database, system will replace new data with the old data and keep old and new data into the history table to show the changes when user clicks on History button.

1. Select the *Technician* Tab.
2. Select the *Technician* you wish to modify.
3. Click *Modify*.
4. Make your necessary changes.
5. Click *OK*.
6. Click *Save*.

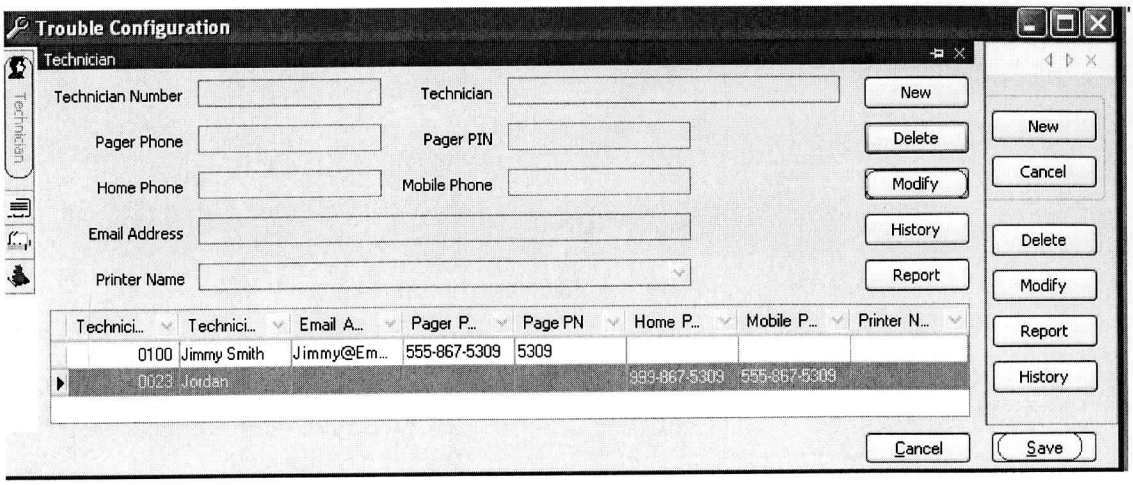

Figure 9: Trouble Technician Modification Screen.

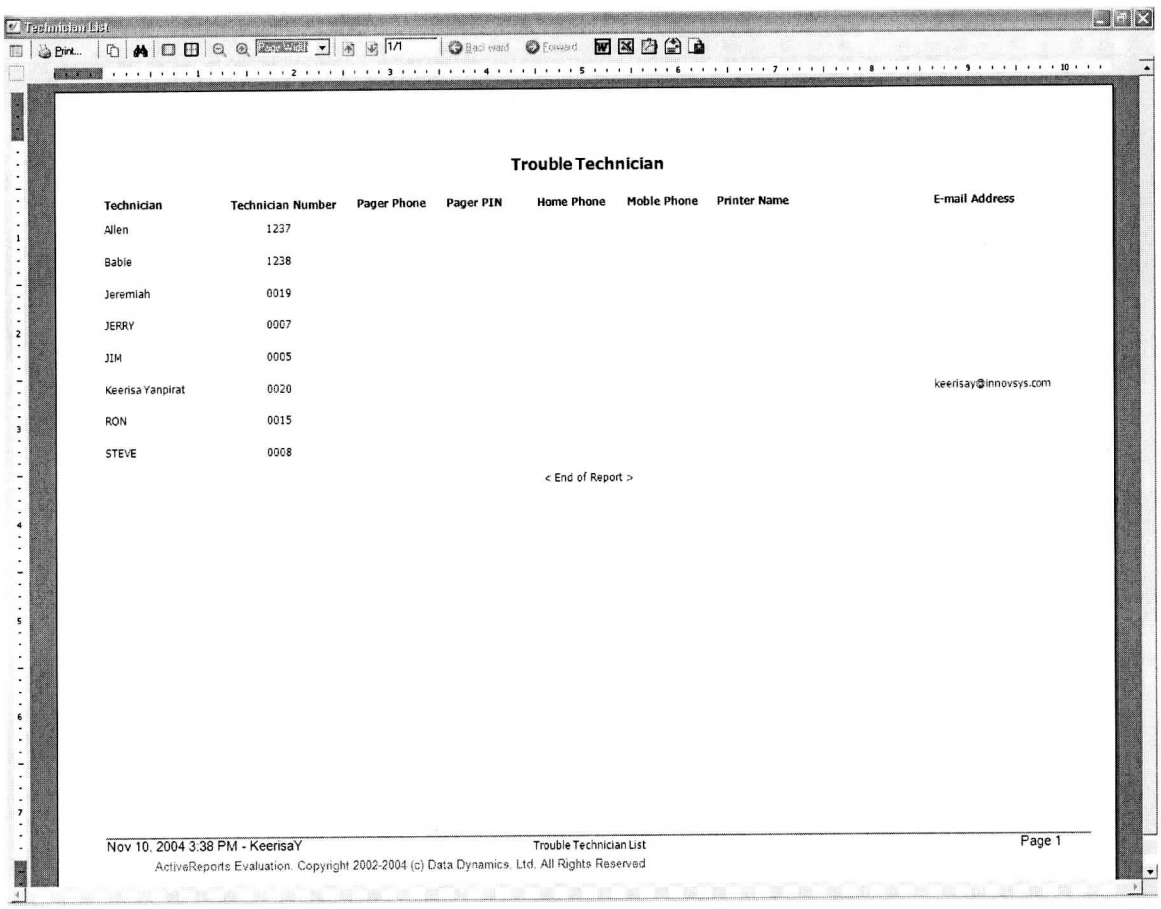

Figure 10: Trouble Technician Report Screen

How to View the Technician Report

1. Select the *Description* Tab.

2. Click *Report*.

How to View the Technician History

1. Select the *Description* Tab.
2. Click *Report*.

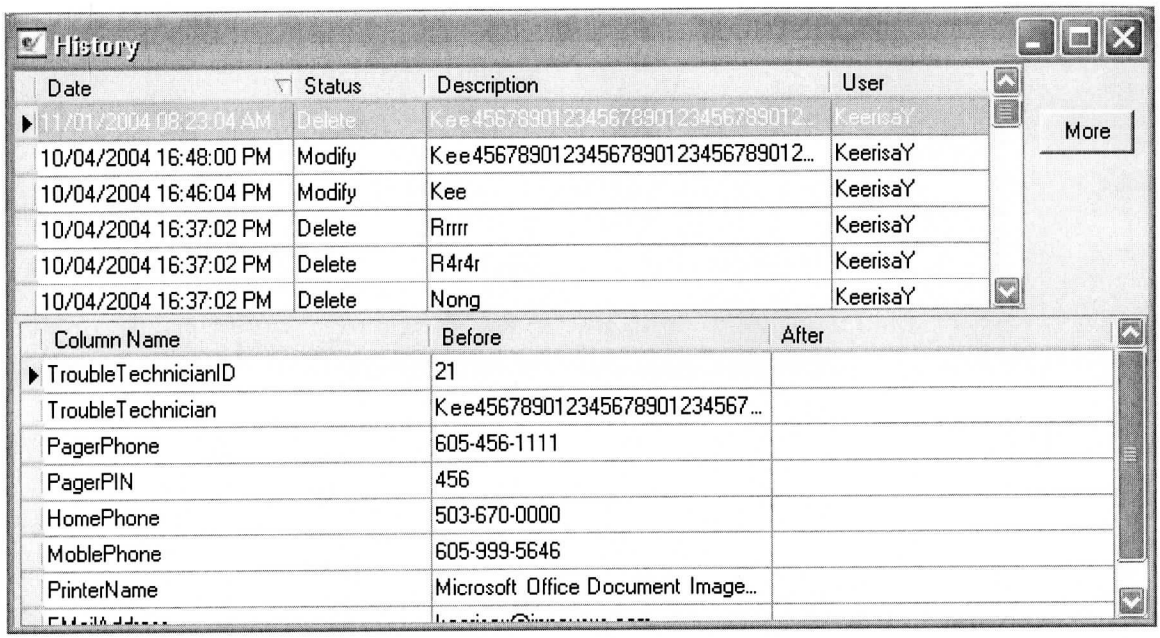

Figure 11: Trouble Technician History Screen

IX. Trouble Ticket Order Process Flow

After Trouble Configuration Table has been set up. The users are required to create an order flow (the process steps). Telecommunication Trouble Ticket system allows users the set notification options and report format at this process.

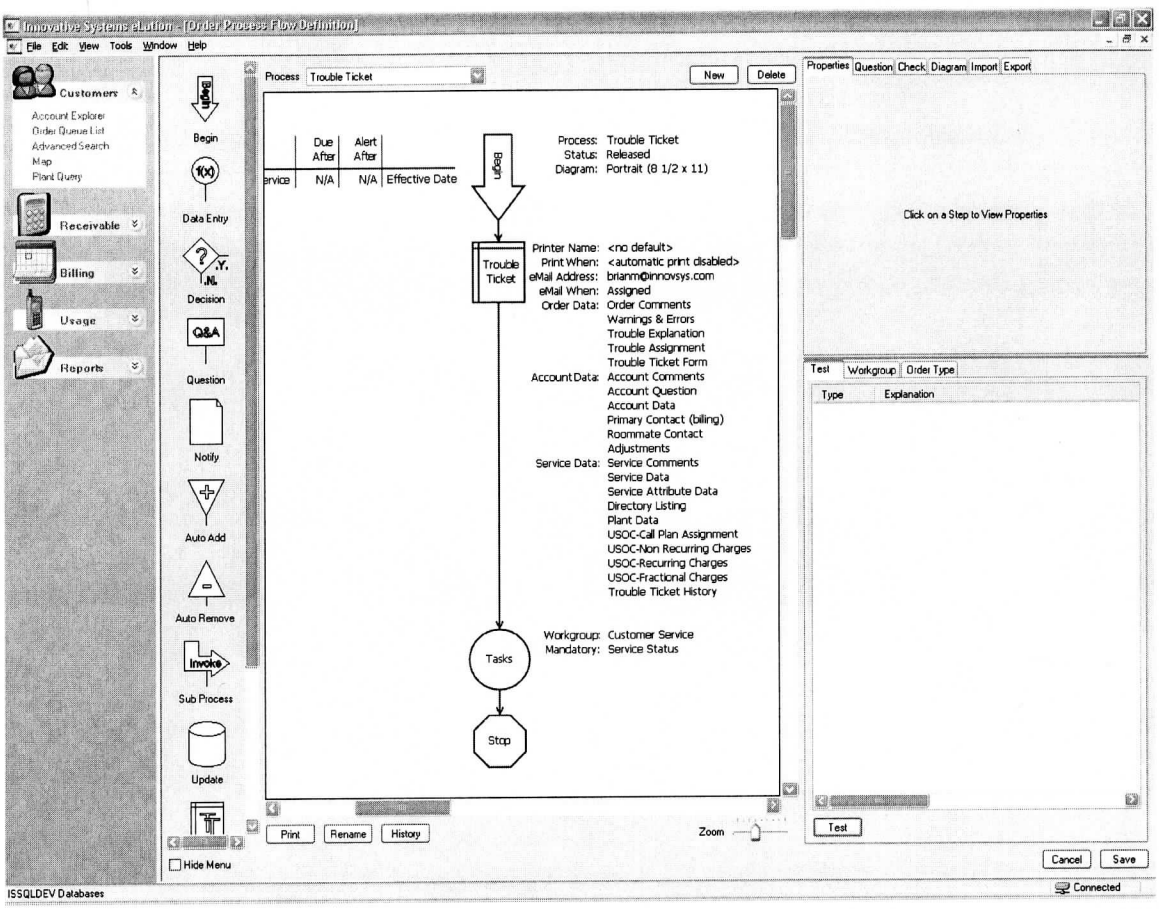

Figure 12: Trouble Ticket Order Process Flow Diagrams

At Properties window, there are 3 different setting tabs (Print, eMail and Contents). They will set the template for every Trouble Ticket that user will be creating. Users are allow to select more than one options by checking the block in front of each select options.

Print Option Tab

Print Tab has four print options for the users to choose when they want trouble ticket to be print using which printer.

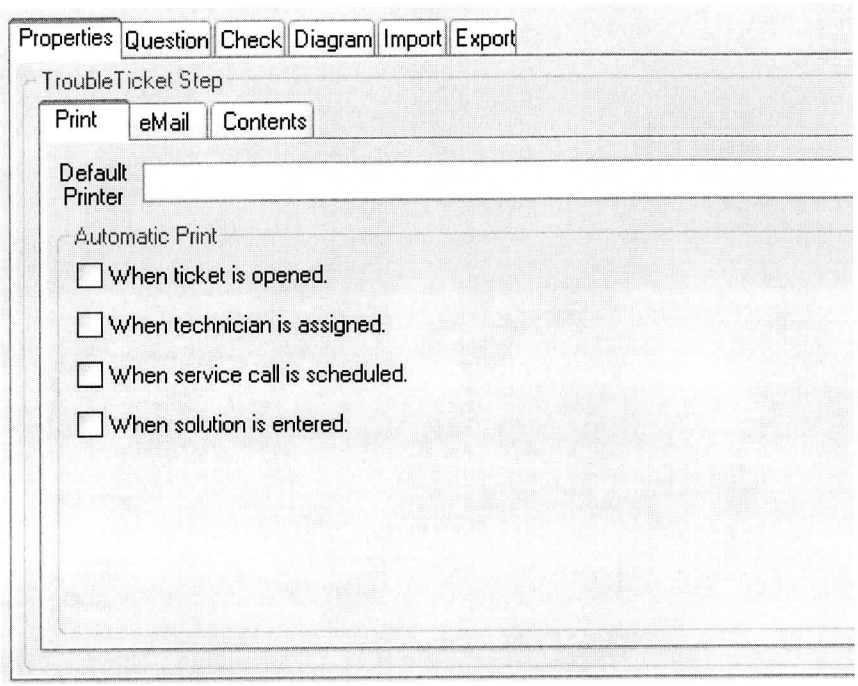

Figure 13: Trouble Ticket Print Options

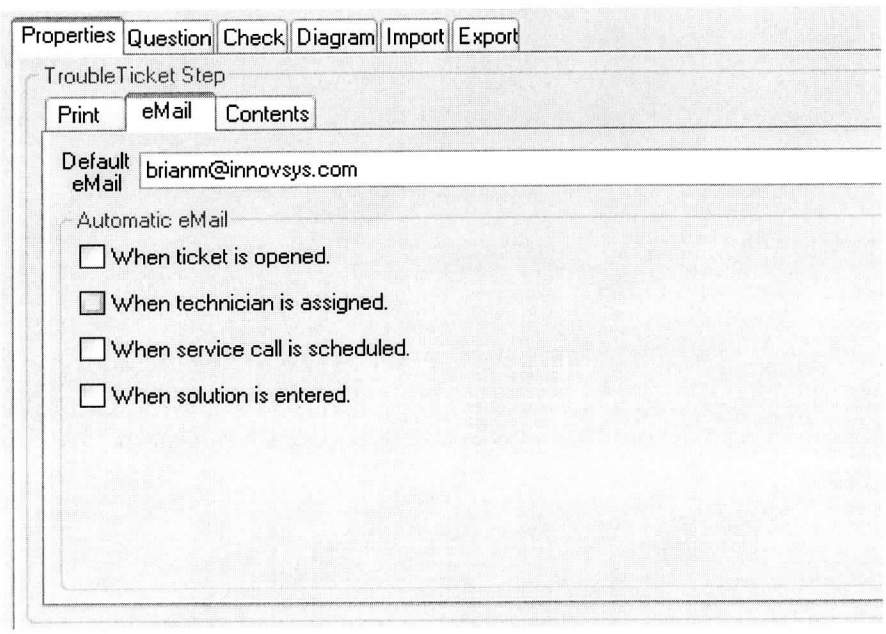

Figure 14: Trouble Ticket Email Options.

Email Option Tab

Email Tab has four automatic sending email options. User can choose the default email address that trouble ticket will send to. User can also send trouble to other email address when users are creating a new trouble ticket

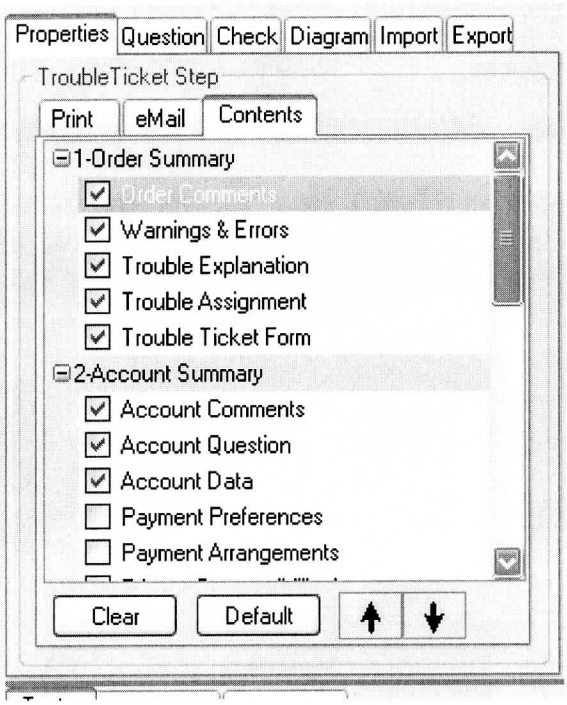

Figure 15: Trouble Ticket Contents Setting.

Trouble Contents Tab

The contents tab is used for the users to select the kind of information they want to include in the trouble ticket. There are 3 level of information (order, account, and service level). Users can clear all the selection by clicking on the Clear button. He Default button will be used when users want to include default information in Trouble ticket. The users can also change the order of information that will be print in trouble ticket by using Up/Down arrow.

X. How to Add a Trouble Order

The following explains how to add a Trouble order to an account. Trouble is a system that provides an easy way to report problems and have the problem assigned to a technician to fix the issue that the customer is experiencing

1. From the Process Toolbar, select *Customers – Account Explorer*, or from the Menu Bar select *Edit – Customers – Account Explorer.*
2. Select the account that is having a problem in *Account Explorer.* Please refer to 'How to Find a Customer' for detailed instructions.
3. Click the Open (create) a new order icon to start an order for the account.

4. Select the *Trouble* process from the drop-down list.

Explanation Tab

1. If the *Reported By* is different than the default choose the correct person from the drop-down list.
2. If the *Reported Date* and *Time* is different than the default choose the correct information from the drop-down lists.
3. Select the *Problem* from the drop-down list. (required)
4. If you wish to change the *Priority* to different level you can type that in.
5. Select the *Severity* from the drop-down list. (required)
6. If available enter the *Contact Name.*
7. If available enter the *Contact Number.*

8. If a *Commitment* is given select from the drop-down list who gave the commitment if different than the default. Select from the drop-down list when the *commitment* was made.
9. In the *Repair Promise Date* field select from the drop-down list the date that the repair was promised to be complete.
10. In the *Resolved* Field select from the drop-down list who resolved the issue and when it was resolved.

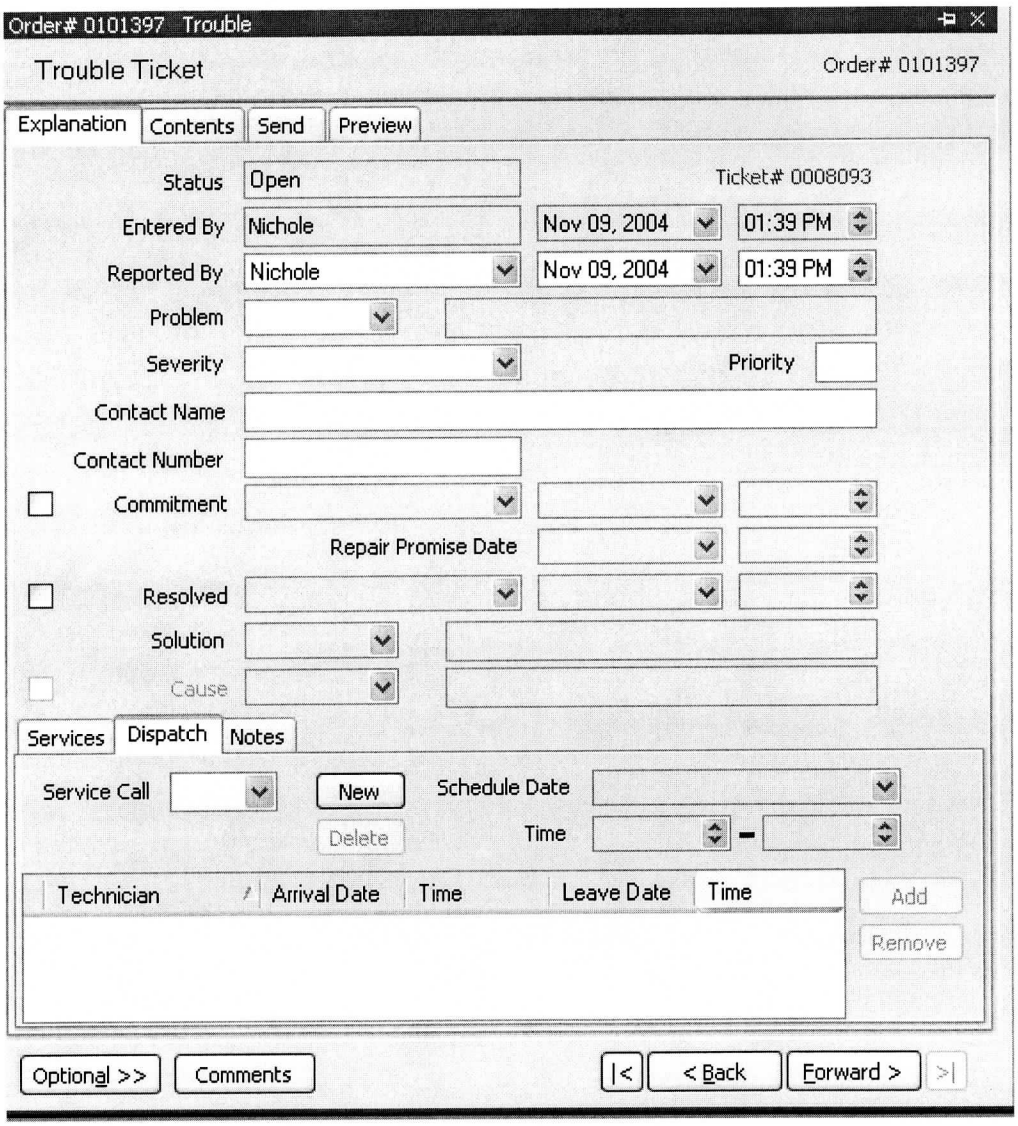

Figure 16: Trouble Ticket Explanation Screen

11. In the *Solution* Field select from the drop-down list what resolved the issue.
12. In the *Cause* Field select from the drop-down list what caused the issue.

Services Tab

The Service Tab allows you the ability to select the service that is having the issue.

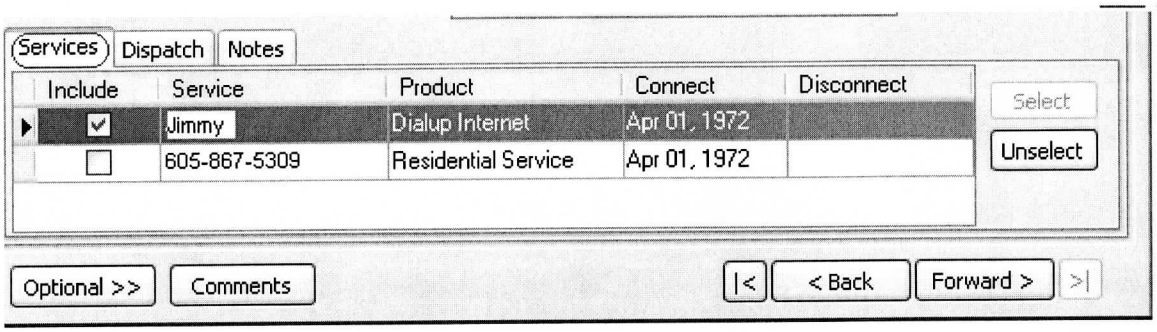

Figure 17: Trouble Ticket Services Tab.

1. On the Select Tab you are able to pick which service is having the issue.
2. If there are multiple services with the issue you can select them by highlighting the additional service that is having an issue and click select.

Dispatch Tab

The Dispatch Tab gives you the ability to schedule a specific Technician at a specific time.

1. To assign a *Technician* to the Trouble Ticket click *New*.
2. Select *the Scheduled Date* and *Time* from the drop-down lists.
3. Select the *Technician* you wish to assign from the drop-down list.
4. Select the *Arrival Date* and *Time* from the drop-down lists.
5. To Remove a *Technician* highlight the technician you wish to remove and click *Remove*.

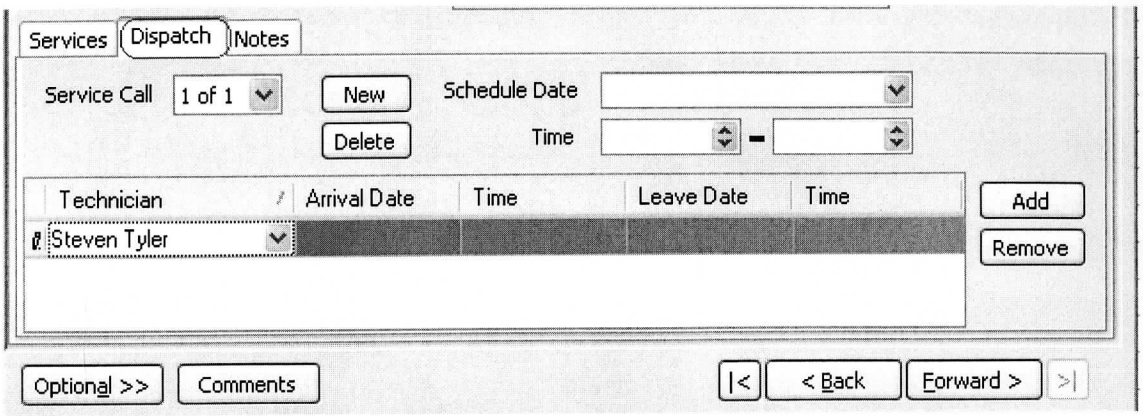

Figure 18: Trouble Ticket Dispatch Tab.

Notes Tab

The Notes Tab is where the customer service representative or the technician can add notes to the ticket.

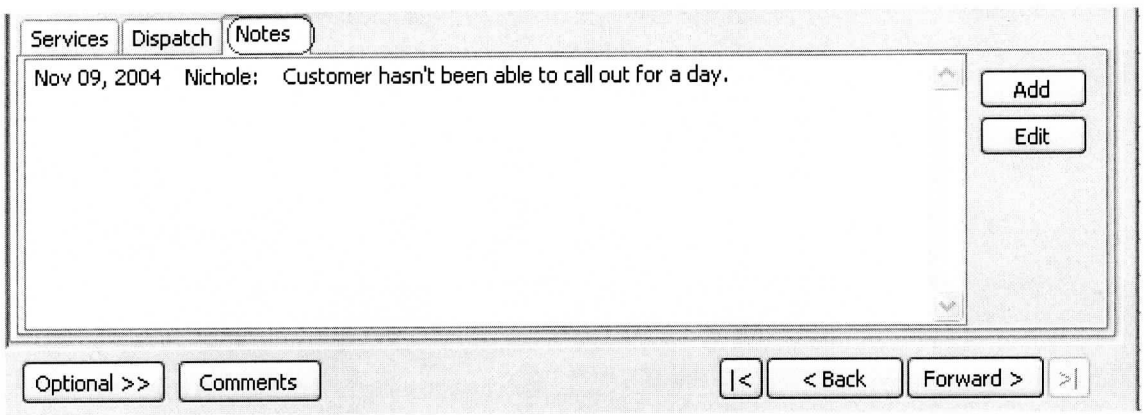

Figure 19: Trouble Ticket Notes Tab

1. To add notes to the trouble ticket click *Add* and type in the notes.
2. To edit the notes click *Edit* and make the appropriate changes.

XI. Conclusion

The Telecom Trouble system will be used instead of paper-based trouble ticket systems to help solve the problem of poor communication and will integrate between customer representative and technician, resolve and report on customer service and repair issues, decrease the average time to resolve support issues (mean-time-to-repair) and operating cost, ensure open issues are handled in the appropriate time, maintain a complete view of each customer, track customer support history over time, verify customer identity and privileges, and track the status of your support requests. This system can also prevent the problem of multiple trouble tickets (repetitive tickets) when the equipment failures.

Telecom Trouble Ticket system adds intelligence to trouble handling procedures, including balancing the workload among technicians, accommodating shift changes, sending automatic escalations and management notifications, and routing tickets to technicians automatically. All while limiting overtime, reducing the need for additional headcount and minimizing truck rolls. The result is a collapse in mean time to repair and improved customer satisfaction.

XII. Discussion

Most of the time I spent for this project was on the design phase. Even though I thought the design was good enough to start to implement the system, in the middle of implementation I had to redesign the database structure again and again to make the system work more efficiency. I had to redesign some interfaces in the Trouble Ticket Configuration section because the screens that I designed before weren't easy to understand because there was a set of hierarchal data tables that needed to be entered in the order. The users started to use the system without reading the manual first. They started to enter the data in the wrong order and the system keep showing the error, making users frustrated. I needed to redesign that lead the user to the correct page and disabled the rest.

After I finished with implementation and testing, the software was sent to the client site. The client came across the problem of deleting a formal technician. The software was design to allow users to delete the technicians that had no ticket assigned to them because the ticket table had a field which stored technicianID linked to a technician in technician table. If I allowed users to delete the technicians that had tickets assigned to them, it woud violate the foreign key constraint rule. I didn't worry about the technicians that had ticket with closed status assign to him. I should have allow the user to delete technicians with closed status tickets assign to them. I fixed the problem by adding a new field to the technician table called "Obsolete" with its type of Boolean to set the obsolete technician and set the data grid to show just the technicians that had obsolete

value equal true. I couldn't permanently delete the formal technician out of the database because there was some closed status tickets referred to the technician.

During the testing process, I had to redesign my interface back and forth so many times as my software was tested by different users. Each one had a different view, they liked different looks. I have learned that implementing the software itself wasn't that difficult but implementing the software that meets the user's preferences is very difficult.

XIII. Future Work

In the future, I will add a new function that allows the customers to report the problem online. The system will allow customers to fill out the form online and submit it. This future function will allow customers to see technicians' available schedules and allow them to schedule the repair time that matches their schedule. As soon as the customer clicks submit, the system will generate the trouble ticket and send an e-mail or page the technician immediately. When the system generates a trouble ticket, the system will automatically match the problem with known solutions and will present suggestions to the technician and the technician may also directly search this database at any time.

Another feature that will be implemented is the feature that sends the signal to the switches and hardware. When customer reports problem that involves turning on/off or reset some hardware, the system will send a signal to the switch to turn on/off or reset it automatically.

XIV. References

1. “The Web’s best CRM-specific information resource”, SearchCRM.com